

The invention claimed is:

1. A part carrying apparatus comprising a part supporting structure and a communications device, the communications device being located entirely within the structure and prevented from external physical observation.
2. The apparatus of Claim 1 wherein the structure is a pallet.
3. The apparatus of Claim 2 wherein the pallet includes at least two polymeric sheets of material which are joined together.
4. The apparatus of Claim 3 wherein the sheets of material are three-dimensionally shaped with heat.
5. The apparatus of Claim 1 wherein the structure includes at least two sheets of material.
6. The apparatus of Claim 5 wherein the communications device is located between the sheets of material.
7. The apparatus of Claim 5 wherein the sheets of material are polymeric.

8. The apparatus of Claim 1 wherein the communications device includes an integrated circuit and the structure is shaped with heat and compression, the device being attached to the structure during shaping.

9. The apparatus of Claim 1 wherein the structure includes at least three three-dimensionally shaped polymeric sheets, at least one of the sheets is three-dimensionally shaped after attachment of the communications device to the sheet, the device is sandwiched between two of the sheets.

10. The apparatus of Claim 1 wherein the communications device is a radio frequency identification tag.

11. An apparatus comprising:  
a first sheet of polymeric material;  
at least a second sheet of polymeric material permanently attached to the first sheet; and  
5 an electrical communications device entirely located between the sheets.

12. The apparatus of Claim 11 further comprising three-dimensionally shaping the sheets after attachment of the communications device to at least one of the sheets.

13. The apparatus of Claim 12 further comprising a heating device operable to heat the sheets in order to allow the sheets to be shaped.

14. The apparatus of Claim 11 wherein the sheets define a fluid carrying container.

15. The apparatus of Claim 14 wherein the sheets define a gasoline tank.

16. The apparatus of Claim 11 wherein at least one of the sheets has multiple hollow legs formed to extend away from the other of the sheets.

17. The apparatus of Claim 11 wherein the sheets define a pallet.

18. The apparatus of Claim 11 wherein the communications device includes a radio frequency identification tag and an interrogator.

19. The apparatus of Claim 11 further comprising a third polymeric sheet attached to at least one of the first and second sheets, the third sheet being thermoformed into a three-dimensional shape.

20. The apparatus of Claim 11 wherein the communications device is an interrogator.

21. The apparatus of Claim 11 further comprising adhesive securing the communications device to at least one of the sheets at least prior to subsequent shaping of the sheet.

22. The apparatus of Claim 11 wherein the communications device includes an integrated circuit mounted upon a flexible film substrate having a heat deflection capability of greater than about 600° Fahrenheit, and the substrate is mounted to at least one of the sheets.

23. An apparatus comprising a pallet made of a recyclable thermoplastic material, and an electrical communications device located inside of the pallet and being substantially prevented from physical external exposure.

24. The apparatus of Claim 23 further comprising a second communications device located entirely inside of the pallet, the first communications device containing externally readable data indicative of a first characteristic and the second communications device containing externally readable data indicative of a second characteristic.

25. The apparatus of Claim 24 wherein the first characteristic indicates ownership of the pallet.

26. The apparatus of Claim 25 wherein the second characteristic pertains to a characteristic of a part transportable by the pallet.

27. The apparatus of Claim 25 wherein the second characteristic pertains to manufacturing process information.

28. The apparatus of Claim 23 further comprising an external interrogator operably communicating with the communications device.

29. The apparatus of Claim 23 wherein the pallet includes at least two polymeric sheets of material with the communications device located between the sheets of material.

30. The apparatus of Claim 23 wherein the communications device is encapsulated within the pallet.

31. The apparatus of Claim 23 further comprising a battery located within the pallet and coupled to the communications device, the battery being externally accessible and replaceable from outside of the pallet.

32. An apparatus comprising:  
an article carrier made of a polymeric material; and  
a radio frequency interrogator entirely located within the carrier, the  
interrogator being operable to read signals transmitted externally from the carrier.

33. The apparatus of Claim 32 wherein the carrier includes at  
least two polymeric sheets.

34. The apparatus of Claim 33 wherein the interrogator is  
attached to at least one of the sheets prior to three-dimensional shaping of the  
sheet.

35. The apparatus of Claim 32 wherein the carrier is a pallet.

36. The apparatus of Claim 32 wherein the interrogator includes  
a heat and compression resistant thermoplastic housing, an electrical circuit  
located inside the housing, and a power source connected to the circuit and  
removably located inside the housing, the housing is disposed inside of the  
5 carrier such that the carrier and housing are recyclable.

37. A pallet comprising:  
a first polymeric sheet;  
at least a second polymeric sheet attached to the first sheet;  
a first radio frequency identification tag located completely between  
5 the sheets, the first tag containing information indicative of a first characteristic;  
and  
a second externally readable identification tag located between the  
sheets, the second tag containing data indicative of a second characteristic.

38. The pallet of Claim 37 wherein the second identification tag  
is a radio frequency identification tag.

39. The pallet of Claim 38 further comprising third and fourth  
radio frequency identification tags located between the sheets.

40. An apparatus comprising a fluid carrying tank made from at  
least two sheets of heat formable polymeric materials, and an electrical wireless  
communications device located inside of the tank.

41. A system comprising:  
a manufacturing machine;  
a receiver;  
an electrical control system connected to the receiver and the  
5 machine;

a product having multiple sheets and a data storage device located  
between the sheets, the product being manufactured by the machine;  
the receiver operably interfacing with the data storage device to  
ascertain data previously stored on the device, the control system changing  
10 manufacturing characteristics of the machine based on a data received from the  
device.

42. The system of Claim 41 wherein the data is ascertained by  
the receiver from the device prior to manufacturing of the product containing the  
device by the machine.

43. The system of Claim 41 wherein the machine includes a  
mold operable to three-dimensionally shape the product.

44. The system of Claim 41 wherein the machine includes a  
heater operable to heat the product to ease in forming.



45. The system of Claim 41 wherein the machine includes a sheet extruder for making the product prior to attachment of the data storage device.

46. The system of Claim 41 wherein the data storage device is a radio frequency identification tag.

47. The system of Claim 46 wherein the receiver is an interrogator operable communicating with the radio frequency identification tag.

48. The system of Claim 41 wherein the machine three-dimensionally shapes the product which subsequently becomes a pallet.

49. The system of Claim 41 wherein the data storage device includes an antenna located entirely inside of the product when in its final manufactured condition.

50. A method of making a product, the product including at least one sheet and a communications device, the method comprising:

- (a) creating the sheet;
- (b) attaching the communications device to the sheet;
- (c) heating the sheet after step (b); and
- (d) forming the sheet after step (b).

51. The method of Claim 50 further comprising making an article carrier from the sheet.

52. The method of Claim 51 wherein the article carrier is a pallet.

53. The method of Claim 51 wherein the article carrier is a gasoline tank.

54. The method of Claim 50 further comprising attaching a second formable sheet to the first sheet so as to sandwich the communications device entirely between the sheets.

55. The method of Claim 54 further comprising thermoforming the sheets which are made of polymeric material.

56. The method of Claim 50 further comprising three-dimensionally forming the sheet with the communications device attached.

57. The method of Claim 50 further comprising transmitting a radio frequency signal from the communications device.

58. The method of Claim 50 further comprising varying a manufacturing step in accordance with data contained within the communications device once the communications device transmits the data to an external electrical control system controlling the manufacturing process.

59. The method of Claim 50 further comprising robotically and automatically locating and attaching the communications device to the sheet.

60. The method of Claim 50 further comprising:

- (a) extruding the sheet;
- (b) cutting the sheet to a predetermined size; and
- (c) thermoforming the sheet in a three-dimensional shape by

5 use of heat and compression after the communications device is attached to a surface of the sheet.

61. A method of making a triple sheet product having an electrical identification tag, the method comprising:

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- (a) three-dimensionally forming a first polymeric sheet;
- (b) three-dimensionally forming a second polymeric sheet;
- (c) three-dimensionally forming a third polymeric sheet;
- (d) joining the sheets together; and
- (e) attaching the tag inside of the product such that the tag is hidden from physical external visibility.

62. The method of Claim 61 further comprising activating an interrogator to communicate with the identification tag.

63. The method of Claim 61 further comprising forming at least one of the sheets while the identification tag is attached to the sheet.

64. A method of making a pallet having an electronic device, the method comprising attaching the electronic device to a portion of the pallet prior to three-dimensionally shaping the portion with heat.

65. The method of Claim 64 wherein the electronic device is an interrogator.

66. The method of Claim 64 wherein the device is a radio frequency identification tag.

67. The method of Claim 64 further comprising applying adhesive between the electronic device and the adjacent portion of the pallet, and using the adhesive as a cushion when the portion is compressed during shaping.

68. The method of Claim 64 wherein the pallet includes at least two polymeric sheets which are three-dimensionally thermoformed and joined together.

69. A method of manufacturing a product with machinery, the method comprising:

(a) electrically communicating between the product and the machinery in a wireless manner;

5 (b) changing an operational characteristic of the machinery prior to processing the product in the machinery, based on the communication of step (a); and

(c) shaping the product with the machinery after step (b).

70. The method of Claim 69 wherein the product is a multiple sheet pallet, wherein the sheets are made of a polymeric material.

71. The method of Claim 69 further comprising communicating between the product and the machinery by transmitting radio frequencies to identify preprogrammed characteristics of the desired end product to be manufactured.

72. A method of using a pallet having an identification device, the method comprising:

(a) preventing the identification device from being externally visible from outside of the pallet;

5 (b) moving the pallet adjacent to an interrogator field;

(c) reading data stored on the identification device after steps (a) and (b); and

(d) identifying a preprogrammed characteristic of the pallet as stored in the identification device.

73. The method of Claim 72 further comprising activating an indicator after an interrogator has received information from the identification device.

74. The method of Claim 73 wherein the indicator is a user visible light that is located external to the pallet.